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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
09/648,111	08/25/2000	Kwang-Jo Hwang	3430-0131P	5562

7590 12/04/2006

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ART UNIT	PAPER NUMBER
2815	

DATE MAILED: 12/04/2006

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BEFORE THE BOARD OF PATENT APPEALS AND INTERFERENCES

Application Number: 09/648,111
Filing Date: August 25, 2000
Appellant(s): HWANG, KWANG-JO

MAILED
DEC 04 2006
GROUP 2800

Esther H. Chong
For Appellant

EXAMINER'S ANSWER

This is in response to the appeal brief filed 6/20/06 with the corrected Summary of Claimed Subject Matter filed 9/15/06 appealing from the Office action mailed 9/20/05.

(1) Real Party in Interest

A statement identifying by name the real party in interest is contained in the brief.

(2) Related Appeals and Interferences

The examiner is not aware of any related appeals, interferences, or judicial proceedings which will directly affect or be directly affected by or have a bearing on the Board's decision in the pending appeal.

(3) Status of Claims

The statement of the status of claims contained in the brief is correct.

(4) Status of Amendments After Final

The appellant's statement of the status of amendments after final rejection contained in the brief is correct.

(5) Summary of Claimed Subject Matter

The summary of claimed subject matter contained in the brief is correct.

(6) Grounds of Rejection to be Reviewed on Appeal

The appellant's statement of the grounds of rejection to be reviewed on appeal is correct.

(7) Claims Appendix

The copy of the appealed claims contained in the Appendix to the brief is correct.

(8) Evidence Relied Upon

5,771,110	HIRANO ET AL.	6-1998
6,133,145	CHEN	10-2000
5,968,847	YE ET AL.	10-1999
JP361002368A	MURAGUCHI ET AL.	1-1986

(9) Grounds of Rejection

The following ground(s) of rejection are applicable to the appealed claims:

Claim Rejections - 35 USC § 103

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

Claims 1, 2, 5 – 9, 11, 13, 15, 16, 20 – 22, 24 and 28 – 31 are rejected under 35 U.S.C. 103(a) as being unpatentable over Hirano et al. (USPAT 5771110, Hirano) in view of Chen (USPAT 6133145).

Hirano discloses in figures 1 – 16 a method of manufacturing a liquid crystal display device.

With regard to claim 1, Hirano discloses in figures 1 - 8 forming a switching element (2 - 7) on a substrate (1). Hirano discloses in figure 13 forming a passivation layer (14) over the substrate. Hirano discloses in figure 14 depositing a metal layer (16) on the passivation layer. Hirano discloses in column 12, lines 54 - 60 forming a photoresist pattern on a surface of the metal layer, such that an upper portion of the metal layer is exposed. Hirano discloses in figure 15 and column 12, lines 54 - 60 etching a portion of the metal layer to form a pixel electrode. Hirano does not teach treating the exposed portion of the metal layer with a first plasma, prior to etching. Chen teaches in figures 5 and 6 and column 4, lines 16 - 24 treating an exposed portion of a metal layer (10a) with a first plasma (a plasma treatment in a nitrogen ambient, col. 4, lines 20 - 24), prior to any step of etching a photoresist pattern (12b), and prior to any step of etching the metal layer. It would have been obvious to one of ordinary skill in the art at the time of the present invention to use the treating method of Chen in the method of Hirano in order to slow the removal rate of the resist pattern by causing the resist pattern to become more resilient as taught by Chen in column 1, lines 29 - 35 and column 4, lines 17 - 24. This slowed removal rate of the resist will ensure the integrity of the metal etch during the entire etch cycle allowing narrower metal electrodes to be defined. Further, "thereby lowering an internal binding force in the exposed portion of the metal layer" is an intended use recitation that does not define a manipulative difference between the combination of Hirano and Chen with the claimed invention because net result of the etch treatment of Chen, when performed during the invention of Hirano, would thereby lower an internal binding force in the exposed portion of the

metal layer of Hirano. Lowering an internal binding force in the exposed portion of the metal layer to increase a subsequent etch rate of the metal layer is a necessary result of using the plasma treatment of Chen in the method of Hirano. The combination of Hirano and Chen teaches wherein the depositing a metal layer on the passivation layer, forming a photoresist pattern, and treating the exposed portion of the metal layer are sequentially performed.

With regard to claim 2, Hirano discloses in column 11, line 63 wherein the switching element is a thin film transistor.

With regard to claim 5, Chen teaches in figure 5 and column 4, lines 16 – 24 using a non-reactive gas to lower a binding force in the exposed portion.

With regard to claim 6, Chen discloses in figure 5 and column 4, lines 16 – 24 wherein the non-reactive gas includes N_2.

With regard to claim 7, Hirano discloses in column 12, lines 54 – 60 the step of etching the metal layer involves a dry-etching technique.

With regard to claim 8, Hirano discloses in column 12, lines 54 – 60 the step of etching the metal layer includes etching the metal layer with HBr plasma gas.

With regard to claim 9, Hirano discloses in column 12, lines 54 – 60 the step of etching the metal layer includes etching the metal layer with a composition of HBr plasma gas and Cl_2 plasma gas.

With regard to claim 11, Hirano discloses in column 12, lines 48 – 60 the metal layer is indium tin oxide (ITO).

With regard to claim 13, Chen discloses in figure 5 and column 4, lines 16 – 24 wherein the first gas is a reactive gas.

With regard to claim 15, Chen teaches in figure 5 and column 4, lines 16 – 24 wherein the first gas is a non-reactive gas.

With regard to claim 16, Chen discloses in figure 5 and column 4, lines 16 – 24 wherein the non-reactive gas includes N_2.

With regard to claim 20, Hirano discloses in column 12, lines 48 – 60 wherein the metal layer is indium tin oxide (ITO).

With regard to claim 21, Hirano discloses in figure 15 removing the photoresist pattern from the pixel electrode.

With regard to claim 22, Hirano discloses in figure 14, depositing a metal layer (16) over a substrate (1). Hirano discloses in column 12, lines 54 – 60 forming a mask on a surface of the metal layer, leaving an upper portion of the metal layer uncovered. Hirano discloses in column 12, lines 57 – 60 etching the uncovered portion of the metal layer with a second plasma to form a metal pattern. Hirano does not teach exposing the uncovered portion of the metal layer to a first plasma. Chen teaches in figure 5 and column 4, lines 13 – 24 exposing an uncovered portion of a metal layer (10a) to a first plasma (a plasma treatment in a nitrogen ambient, col. 4, lines 20 – 24) prior to any step of etching the metal layer, thereby lowering an internal binding force in the uncovered portion. It would have been obvious to one of ordinary skill in the art at the time of the present invention to use the exposing method of Chen in the method of Hirano in order to slow the removal rate of the resist pattern by causing the resist pattern to become

more resilient as taught by Chen in column 1, lines 29 - 35 and column 4, lines 17 - 24. This slowed removal rate of the resist will ensure the integrity of the metal etch during the entire etch cycle allowing narrower metal electrodes to be defined. Further, "thereby lowering an internal binding force in the exposed portion of the metal layer" is an intended use recitation that does not define a manipulative difference between the combination of Hirano and Chen with the claimed invention because net result of the etch treatment of Chen, when performed during the invention of Hirano, would thereby lower an internal binding force in the exposed portion of the metal layer. Lowering an internal binding force in the uncovered portion of the metal layer to increase a subsequent etch rate of the metal layer is a necessary result of using the plasma treatment of Chen in the method of Hirano. The combination of Hirano and Chen teaches wherein the depositing a metal layer over a substrate, forming a mask on a surface of the metal layer, and exposing the uncovered portion of the metal layer are sequentially performed.

With regard to claim 24, Chen teaches in figure 5 and column 4, lines 13 – 24 wherein the first plasma includes N_2.

With regard to claim 28, Hirano discloses in column 12, lines 48 – 60 the metal layer is indium tin oxide (ITO).

With regard to claim 29, Hirano discloses in figure 15 that the metal pattern includes a pixel electrode of a display device.

With regard to claim 30, Hirano discloses in figure 14 depositing a metal layer (16) on a passivation layer (14) which partially covers a transistor (2 – 7). Hirano

discloses in column 12, lines 48 – 60 forming a photoresist pattern on a surface of the metal layer, leaving an upper portion of the metal layer uncovered. Hirano discloses in column 12, lines 57 – 60 etching the uncovered portion of the metal layer with a second plasma to form a pixel electrode. Hirano does not teach exposing the uncovered portion of the metal layer to a first plasma, prior to etching. Chen teaches in figure 5 and column 4, lines 16 – 24 exposing an uncovered portion of a metal layer (10a) to at least one first gas (a plasma treatment in a nitrogen ambient, col. 4, lines 20 – 24), prior to any step of etching a photoresist pattern (12b) and prior to any step of etching the metal layer to lower an internal binding force in the uncovered portion. It would have been obvious to one of ordinary skill in the art at the time of the present invention to use the exposing method of Chen in the method of Hirano in order to slow the removal rate of the resist pattern by causing the resist pattern to become more resilient as taught by Chen in column 1, lines 29 - 35 and column 4, lines 17 - 24. This slowed removal rate of the resist will ensure the integrity of the metal etch during the entire etch cycle allowing narrower metal electrodes to be defined. Further, "to lower an internal binding force in the exposed portion of the metal layer" is an intended use recitation that does not define a manipulative difference between the combination of Hirano and Chen with the claimed invention because net result of the etch treatment of Chen, when performed during the invention of Hirano, would be to lower an internal binding force in the exposed portion of the metal layer. Lowering an internal binding force in the uncovered portion of the metal layer to increase a subsequent etch rate of the metal layer is a necessary result of using the plasma treatment of Chen in the method of Hirano. The

combination of Hirano and Chen teaches wherein the depositing a metal layer on the passivation layer, forming a photoresist pattern, and exposing the uncovered portion of the metal layer are sequentially performed.

With regard to claim 31, Hirano discloses in figure 14 depositing a metal layer (16) on a passivation layer (14) which partially covers a transistor (2 – 7). Hirano discloses in column 12, lines 48 – 60 forming a photoresist pattern on a surface of the metal layer, leaving an upper portion of the metal layer uncovered. Hirano discloses in column 12, lines 57 – 60 etching the uncovered portion of the metal layer with a second plasma to form a pixel electrode. Hirano does not teach exposing the uncovered portion of the metal layer to a first plasma, prior to etching. Chen teaches in figure 5 and column 4, lines 16 – 24 exposing an exposed portion of a metal layer (10a) to at least one first gas (a plasma treatment in a nitrogen ambient, col. 4, lines 20 – 24), prior to any step of etching, to lower an internal binding force in the uncovered portion. It would have been obvious to one of ordinary skill in the art at the time of the present invention to use the exposing method of Chen in the method of Hirano in order to slow the removal rate of the resist pattern by causing the resist pattern to become more resilient as taught by Chen in column 1, lines 29 - 35 and column 4, lines 17 - 24. This slowed removal rate of the resist will ensure the integrity of the metal etch during the entire etch cycle allowing narrower metal electrodes to be defined. Further, "to lower an internal binding force in the exposed portion of the metal layer" is an intended use recitation that does not define a manipulative difference between the combination of Hirano and Chen with the claimed invention because net result of the etch treatment of

Chen, when performed during the invention of Hirano, would be to lower an internal binding force in the exposed portion of the metal layer. With regard to claim 30, Hirano discloses in figure 14 depositing a metal layer (16) on a passivation layer (14) which partially covers a transistor (2 – 7). Hirano discloses in column 12, lines 48 – 60 forming a photoresist pattern on a surface of the metal layer, leaving a portion of the metal layer uncovered. Hirano discloses in column 12, lines 57 – 60 etching the uncovered portion of the metal layer with a second plasma to form a pixel electrode. Hirano does not teach exposing the uncovered portion of the metal layer to a first plasma, prior to etching. Chen teaches in figure 5 and column 4, lines 16 – 24 exposing an uncovered portion of a metal layer (10a) to at least one first gas (a plasma treatment in a nitrogen ambient, col. 4, lines 20 – 24), prior to any step of etching a photoresist pattern (12b) and prior to any step of etching the metal layer to lower an internal binding force in the uncovered portion. It would have been obvious to one of ordinary skill in the art at the time of the present invention to use the exposing method of Chen in the method of Hirano in order to slow the removal rate of the resist pattern by causing the resist pattern to become more resilient as taught by Chen in column 1, lines 29 - 35 and column 4, lines 17 - 24. This slowed removal rate of the resist will ensure the integrity of the metal etch during the entire etch cycle allowing narrower metal electrodes to be defined. Further, "to lower an internal binding force in the exposed portion of the metal layer" is an intended use recitation that does not define a manipulative difference between the combination of Hirano and Chen with the claimed invention because net result of the etch treatment of Chen, when performed during the

invention of Hirano, would be to lower an internal binding force in the exposed portion of the metal layer. Lowering an internal binding force in the uncovered portion of the metal layer to increase a subsequent etch rate of the metal layer is a necessary result of using the plasma treatment of Chen in the method of Hirano. The combination of Hirano and Chen teaches wherein the depositing a metal layer on the passivation layer, forming a photoresist pattern, and exposing the uncovered portion of the metal layer are sequentially performed.

Claims 10, 17 – 19, and 25 – 27 are rejected under 35 U.S.C. 103(a) as being unpatentable over Hirano and Chen as applied to claims 1, 7, 22 and 30 respectively, above, and further in view of Ye et al. (USPAT 5968847, Ye).

With regard to claim 10, Hirano and Chen do not disclose the combination of HBr and CH_4 as plasma gasses. Ye teaches in column 12, lines 55 – 62 that a composition of HBr and CH_4 can be used for etching a metal layer. It would have been obvious to one of ordinary skill in the art at the time of the present invention to use the composition of HBr and CH_4 for etching a metal layer because both are well known etching gasses that are readily available in a production fabrication facility.

With regard to claims 17 and 18, Hirano discloses at least one second gas that includes Cl_2. Hirano and Chen do not disclose that the at least one second gas includes an HBr plasma gas. Ye teaches in column 5, lines 15 – 20 at least one second gas that includes an HBr plasma gas. It would have been obvious to one of ordinary skill in the art at the time of the present invention to use the HBr plasma gas of Ye as an additional

gas with Cl_2 in the second etch step of Hirano and Chen for etching a metal layer in order to enhance the etching properties of the plasma by creating a more diverse reactive plasma gas.

With regard to claims 25 and 26, Hirano discloses a second plasma gas that includes Cl_2. Hirano and Chen do not disclose that the second plasma gas includes an HBr plasma gas. Ye teaches in column 5, lines 15 – 20 a plasma that includes both HBr and Cl_2 for removing a metal layer. It would have been obvious to one of ordinary skill in the art at the time of the present invention to use the HBr plasma gas of Ye as an additional gas with Cl_2 in the second etch step of Hirano and Chen for etching a metal layer in order to enhance the etching properties of the plasma by creating a more diverse reactive plasma gas.

With regard to claim 19, Hirano discloses at least one second gas that includes Cl_2. Hirano and Chen do not teach the use of HBr and CH_4 as etching gasses. Ye discloses in column 5, lines 15 – 20 the use of HBr and CH_4 in the same metal etch step that just Cl_2 is used. It would have been obvious to one of ordinary skill in the art at the time of the present invention to use the combination of HBr and CH_4 of Ye as a substitute gas for Cl_2 of Hirano and Chen in the second etching step in order to enhance the etching properties of the plasma by creating a more diverse reactive plasma gas.

With regard to claim 27, Hirano discloses the use of Cl_2 for the second etching step. Hirano and Chen do not teach the use of HBr and CH_4 as etching gasses. Ye discloses in column 5, lines 15 – 20 the use of HBr and CH_4 in the same metal etch step that just Cl_2 is used in. It would have been obvious to one of ordinary skill in the art at

the time of the present invention to use the combination of HBr and CH_4 of Ye as a substitute gas for Cl_2 of Hirano and Chen in the second etching step in order to enhance the etching properties of the plasma by creating a more diverse reactive plasma gas.

Claims 3, 4, 14, and 23 are rejected under 35 U.S.C. 103(a) as being unpatentable over Hirano and Chen as applied to claims 1, 13, 22 and 30, respectively, above, and further in view of Muraguchi et al. (JPPAT 361002368, Muraguchi).

With regard to claim 3, Hirano and Chen do not teach the step of treating the exposed portion of the metal layers includes using a reactive gas. Muraguchi teaches in the Constitution using a reactive gas in a step of treating an exposed portion of a metal layer to lower a binding force in the exposed portion. It would have been obvious to one of ordinary skill in the art at the time of the present invention to use the reactive gas of Muraguchi in the method of Hirano and Chen in order to reduce oxygen atoms without resulting in crystal damage to the surface.

With regard to claims 4 and 14, Muraguchi discloses that the reactive gas is H_2.

With regard to claim 23, for the same reasons as stated above with regard to claims 3, 4 and 14 it would have been obvious to use the H_2 plasma gas of Muraguchi in the first plasma of Hirano and Chen.

(10) Response to Argument

Response to Section VII-A

Section VII-A of appellant's brief, which spans from page 8 to page 9 of the brief, is merely a brief statement of appellant's invention. This section does not include any arguments regarding the rejections applied against appellant's claimed invention, the prior art applied against appellant's claims, or any arguments alleging particular reasons why appellant's invention is allowable. Thus, this section does not present any arguments or evidence to overcome the applied rejections.

Response to Section VII-B

Appellant begins by presenting multiple citations of case law regarding obviousness rejections under 35 USC §103. See pages 9 through the line 4 of page 12 of appellant's brief. While all the cited case law is relevant to the Examiner's duty to establish a *prima facie* case of obviousness, the citation of the case law itself does not present any arguments in regards to the rejection and *prima facie* case of obviousness established by the Examiner in the instant application. As clearly set forth in the applied rejection, as recited above, the Examiner has established a *prima facie* case of obviousness.

Beginning on page 12 line 5 of the brief, appellant presents arguments regarding the applied rejection.

Appellant first argues on page 12 lines 5-6 of their brief that none of the applied art teaches reducing the binding force in the metal layer so as to enhance the etch rate. This is not persuasive. Though not explicitly stated in Hirano or Chen, this limitation is a necessary result of the combination. As clearly explained in the applied rejection, the "net result of the etch treatment of Chen, when performed during the invention of Hirano, would thereby lower an internal binding force in the exposed portion of the metal layer of Hirano. Lowering an internal binding force in the exposed portion of the metal layer to increase a subsequent etch rate of the metal layer is a necessary result of using the plasma treatment of Chen in the method of Hirano." That is, the claimed reduction in the binding force in the metal layer so as to enhance the etch rate is a necessary physical result of the combination.

The Final Rejection clearly explains that Chen teach a plasma treatment step of exposing the photoresist and uncovered (exposed) portions of the metal layer to a nitrogen plasma. Chen teaches an advantage of the plasma treatment to harden the photoresist making the etch more selective. Thus, motivation has been provided for adding Chen's plasma treatment step into the method of Hirano. In the plasma treatment step of Chen, the entire structure is exposed to the nitrogen plasma. That is the photoresist pattern 12b as well as the metal layer 10a are exposed to the plasma treatment. See Chen figure 5. In combining the plasma treatment step of Chen into the process of Hirano, the plasma treatment is performed on the photoresist and exposed portion of Hirano's ITO 16 (Indium Tin Oxide, metal layer). This plasma treatment

performed on the exposed surface of the metal layer is the same plasma treatment as appellant's invention.

In performing the plasma treatment step of Chen on the photoresist pattern and exposed metal layer of Hirano, the lowering of an internal binding force in the exposed portion of the metal layer would take place as the plasma treatment step in Chen is the identical plasma treatment step of the instant invention. Therefore, the combination reads on and teaches all the limitations of the claims.

Appellant argues on the second full paragraph of page 12 through the first half of page 13 of their brief that Hirano teaches nothing about reducing the internal binding force. This argument is not persuasive to overcome the *prima facie* case of obviousness over the combination of Hirano and Chen. As explained above, although Hirano by itself does not teach reducing the internal binding force, the rejection as a whole does teach this limitation since the references as combined will necessarily result in the reduction of the internal binding force. One cannot show nonobviousness by attacking references individually where the rejections are based on combinations of references. See *In re Keller*, 642 F.2d 413, 208 USPQ 871 (CCPA 1981); *In re Merck & Co.*, 800 F.2d 1091, 231 USPQ 375 (Fed. Cir. 1986).

Appellant then presents arguments against Chen. On the second paragraph of page 14 of appellant's brief, appellant argues that Chen "uses a plasma treatment to render the material more resistant to etch" while in contrast "the present invention

reduces the internal binding force of the material in order to enhance the etch rate" and that Chen "thus teaches away from one of the important objects of the invention." This argument is not persuasive. This argument is incorrect in that it contrasts the effect upon one material to the opposite effect upon a different material and then states that these effects are not the same. The examiner disagrees with appellant's statement in that it uses the same term "the material" in discussing both Chen and the instant invention where the effects being discusses in fact relate to two different materials.

Chen uses a plasma treatment to render the **photoresist** more resistant to etch. Chen is silent as to the effect of the plasma treatment upon the metal layer. The present invention reduces the internal binding force of the **metal layer** in order to enhance the etch rate thereof. The present invention is silent as to the effect of the plasma treatment upon the photoresist. Thus, these two features, rendering the photoresist more resistant to etch and enhancing the etch rate of the metal layer, are not contrasting or conflicting effects. There is no teaching in the prior art or even in appellant's disclosure that rendering the photoresist more resistant to etch teaches away from lowering the binding force of the metal layer.

Appellant then argues that unlike Chen, the present invention does not modify the properties of the resist. This is not persuasive as appellant's disclosure and invention are merely silent as to the properties of the resist. Appellant's claims are silent as to the properties of the resist also being modified during the plasma treatment step and the claims do not preclude the resist being modified along with the metal layer

during the plasma treatment step. The fact that appellant did not recognize that the same plasma treatment step would also modify the resist does not show unobviousness.

Appellant then argues that in contrast to modifying the resist, the instant invention modifies the properties of the metal layer. This is not persuasive. Chen uses the same plasma treatment process as the instant invention. In combination with Hirano, the plasma step of Chen is performed upon the same material as in the instant invention. Therefore, the result would be the same in that the properties of the metal layer in the combination of Hirano and Chen would be modified in the same was as in the instant invention. The fact that Hirano and Chen are silent as to the properties of the metal layer does not prove that in performing the plasma treatment of Chen to the metal layer of Hirano the properties of the metal layer would not be modified in the same manner as in the instant invention. Appellant has not provided any reasoned arguments or evidence that performing the plasma treatment of Chen in the process of Hirano would result in a different process than that claimed.

Appellant then argues that adapting the plasma of Chen to modify the metal impermissibly changes the principle operation of Chen. This argument is not persuasive as the rejection does not rely upon adapting the plasma of Chen. Since the plasma of Chen is not adapted in the rejection of the claims the principle of operation of Chen is not changed. In the combination, Chen is relied upon to teach a plasma

treatment that renders the photoresist more resistant to etch, thereby improving the etch rate selectivity between metal and photoresist. Further, the necessary result of the metal being modified does not change or affect Chen's teaching of the photoresist becoming more resilient due to the plasma treatment.

Appellant then argues in the first paragraph on page 16 of thief brief that at "page 3 lines 7-14 of the Office Action of February 3, 2005, the Examiner then asserts that lowering the internal binding force in the metal layer is a result effective variable and is a necessary result of combining Chen with Hirano." This argument is not persuasive. First, it is noted that neither in the cited portion of the February 3 Office Action, nor in any other portion of that Office Action or rejection, does the examiner assert that lowering the internal binding force in the metal layer is a result effective variable. This alleged citation from the Office Action is not supported by the text of the Office Action itself.

Appellant then states that by this citation, the Examiner tacitly admits that the combination of Chen with Hirano fails to fairly disclose or suggest each and every element of the independent claims. This is not persuasive. The Examiner has not tacitly admitted that Hirano combined with Chen fail to disclose or suggest any element of the independent claims. As explained above, even though Hirano and Chen do not explicitly address the lowering of the internal binding force, this limitation is nonetheless present and met by the combination of the references. The result of performing the plasma treatment step of Chen in the process of Hirano not only includes rendering the

photoresist more resistant to etch but will necessarily include lowering the internal binding force. Thus, since the claimed lowering of the internal binding force will necessarily be present in the combination of Hirano and Chen, the combination does teach all the claimed limitations and reads on the claimed invention.

In the last paragraph on page 16 through the first paragraph on page 17 of appellant's brief, appellant presents case law and arguments regarding optimization and result effective variables. Appellant alleges that neither Hirano nor Chen recognized the internal binding force as a parameter than can be manipulated to influence the etch rate and as such one of ordinary skill in the art would not recognize internal binding force as an optimizable parameter from the teachings of Hirano and Chen. This is not persuasive. The rejections based upon the combination of Hirano and Chen do not rely upon the optimization of the internal binding force to influence the etch rate. Since no optimization is needed in order to meet the language of the claims, the internal binding force does not need to be recognized as a result effective variable. As such, this argument is not persuasive to overcome the rejection over Hirano combined with Chen.

Appellant concludes this section by arguing that one having ordinary skill in the art would not be motivated by the teachings of Hirano and Chen to produce the invention of the independent claims and that as such a *prima facie* case of obviousness has not been made. This is not persuasive as the rejection clearly states motivation for combining Hirano and Chen. Further, as explained in the rejection and further elaborated upon above, the combination of Hirano and Chen does produce the

invention as claimed as the combination as applied will necessarily teach all the claimed limitations. As such, the rejection as applied has clearly established a *prima facie* case of obviousness.

Response to Section VII-C

Appellant's arguments presented in the last two paragraphs of page 17 of their brief are not persuasive. Appellant has argued that the teachings of Ye fail to address the deficiencies of Hirano and Chen in suggesting a claimed embodiment of the invention. As clearly explained above, Hirano and Chen are properly combinable and *prima facie* obviousness has been established over the claimed embodiment of the invention. Appellant has not presented any further arguments regarding the combination of Hirano and Chen with Ye. Therefore, the rejection of claims 10, 17-19 and 25-27 over Hirano and Chen and further in view of Ye is considered proper.

Response to Section VII-D

Appellant's arguments presented in the first two paragraphs of page 18 of their brief are not persuasive. Appellant has argued that the teachings of Muraguchi fail to address the deficiencies of Hirano and Chen in suggesting a claimed embodiment of the invention. As clearly explained above, Hirano and Chen are properly combinable and *prima facie* obviousness has been established over the claimed embodiment of the invention. Appellant has not presented any further arguments regarding the

combination of Hirano and Chen with Muraguchi. Therefore, the rejection of claims 3, 4, 14 and 23 over Hirano and Chen and further in view of Muraguchi is considered proper.

Response to Section VII-E

Appellant argues that even if, assuming *arguendo*, the applied references are sufficient to establish *prima facie* obviousness over the present invention, this obviousness would be fully rebutted by the unexpected results of the instant invention. Appellant relies upon figure 7 of their disclosure as evidence of unexpected results. Appellant alleges that as shown in figure 7, the present invention achieves an etch rate about twice as high as that of the conventional technology and that this higher etch rate is an unexpected result compared to the applied art references.

First, the comparison shown in figure 7 is not between the instant invention and the applied art references, but is instead a comparison of appellant's invention and the conventional art discussed in the background section of appellant's disclosure. As such, this allegedly unexpected result is not compared to the **applied** art references as argued.

Second, nowhere along appellant's figure 7 is data presented that shows at etch rate "about twice as high.' At one data point, using the HBr etch chemistry, the instant invention achieves an etch rate of approximately 530 while the conventional art achieves an etch rate of approximately 340. This data represents an approximate etch rate of 1.5-1.6 times the conventional art, not the alleged twice as high. At a second data point, using the HBr/Cl_2 etch chemistry, the instant invention achieves an etch rate

of approximately 430 while the conventional art achieves an etch rate of approximately 350. This data represents an approximate etch rate of 1.2 times the conventional art, not the alleged twice as high. At the third data point, using the HBr/CH_4 etch chemistry, the instant invention achieves an etch rate of approximately 375 while the conventional art achieves an etch rate of approximately 360. This data represents an approximate etch rate of 1.05 times the conventional art, not the alleged twice as high. Thus, figure 7 of appellant's disclosure does not provide evidence of an unexpected result or an etch rate "twice as high" as the conventional etch rate.

Third, appellant's figure 7 does not provide evidence as to which plasma treatment was performed. Appellant's disclosure and claims recite the plasma being chosen from either nitrogen, hydrogen or argon gas. It is not apparent from appellant's arguments or original disclosure which plasma treatment was used in the gathering the data of figure 7

Fourth, even if the first data point in figure 7, that of the HBr etch chemistry, is sufficient to show unexpected results, these results are not commensurate with the scope of the claims. For appellant's data to show unexpected results sufficient to overcome the *prima facie* case of obviousness the unexpected results must necessarily be commensurate with the scope of the invention claimed. In the instant case, at least the third data point of figure 3 (the HBr/CH_4 etch chemistry) shows that using some etch chemistries no unexpected result is achieved. Since the scope of the independent claims is not limited to a certain etch chemistry, these claims include using etch

chemistries that may result in no difference in etch rate with or without the plasma treatment step.

Further, even if appellant's figure 7 is taken as showing unexpected results. The unexpected results are not sufficient to overcome the case of *prima facie* obviousness. In making this determination it is necessary to consider the record as a whole, including the invention as a whole with it's allegedly unexpected result, and the prior art as a whole including it's expected results. In the instant case, one of ordinary skill in the art would recognize the expected advantage of combining the plasma treatment of Chen into the method of Hirano. The expected result would be an advantageous improved etch selectivity. The alleged unexpected result that appellant has recognized is a possible increase in etch rate of the metal layer. The alleged unexpected result within the scope of the claims has been shown above to include as small as a 5% increase compared to the conventional art. This small increase in etch rate is not considered sufficient to overcome the *prima facie* case of obviousness and does not lend patentability to an otherwise obvious method.

Further, appellant's alleged unexpected results are not considered persuasive in overcoming the *prima facie* case of obviousness since applicant has merely recited an additional advantage that is already present in and would flow naturally from the suggestion of the prior art. As recited in MPEP 2145 section II:

> Mere recognition of latent properties in the prior art does not render nonobvious an otherwise known invention. In re Wiseman, 596 F.2d 1019, 201 USPQ 658 (CCPA 1979) (Claims

were directed to grooved carbon disc brakes wherein the grooves were provided to vent steam or vapor during a braking action. A prior art reference taught noncarbon disc brakes which were grooved for the purpose of cooling the faces of the braking members and eliminating dust. The court held the prior art references when combined would overcome the problems of dust and overheating solved by the prior art and would inherently overcome the steam or vapor cause of the problem relied upon for patentability by applicants. Granting a patent on the discovery of an unknown but inherent function (here venting steam or vapor) "would re-move from the public that which is in the public domain by virtue of its inclusion in, or obviousness from, the prior art." 596 F.2d at 1022, 201 USPQ at 661.); In re Baxter Travenol Labs., 952 F.2d 388, 21 USPQ2d 1281 (Fed. Cir. 1991) (Appellant argued that the presence of DEHP as the plasticizer in a blood collection bag unexpectedly suppressed hemolysis and therefore rebutted any prima facie showing of obviousness, however the closest prior art utilizing a DEHP plasticized blood collection bag inherently achieved same result, although this fact was unknown in the prior art.).

"The fact that appellant has recognized another advantage which would flow naturally from following the suggestion of the prior art cannot be the basis for patentability when the differences would otherwise be obvious." Ex parte Obiaya, 227 USPQ 58, 60 (Bd. Pat. App. & Inter. 1985) (The prior art taught combustion fluid analyzers which used labyrinth heaters to maintain the samples at a uniform temperature. Although appellant showed an unexpectedly shorter response time was obtained when a labyrinth heater was employed, the Board held this advantage would flow naturally from following the suggestion of the prior art.). See also Lantech Inc. v. Kaufman Co. of Ohio Inc., 878 F.2d 1446, 12 USPQ2d 1076, 1077 (Fed. Cir. 1989), cert. denied, 493 U.S. 1058 (1990) (unpublished — not citable as precedent) ("The recitation of an additional advantage associated with doing what the prior art suggests does not lend patentability to an otherwise unpatentable invention.").

As such, appellant's invention is *prima facie* obvious since the recognition of a property or advantage which would flow naturally from the prior art does not render unobvious or lend patentability to an otherwise obvious invention.

(11) Related Proceeding(s) Appendix

No decision rendered by a court or the Board is identified by the examiner in the Related Appeals and Interferences section of this examiner's answer.

For the above reasons, it is believed that the rejections should be sustained.

Respectfully submitted,

N. Drew Richards

N. DREW RICHARDS
PRIMARY EXAMINER

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